Yoruba

Laniran & Clements (2003)

Basics

- Yoruba is a three-tone system.

lú	‘to mix together,’	ìlú	‘city,’
lu	‘to perforate,’	ìlu	‘perforator,’
lù	‘to beat,’	ìlù	‘drum.’

- Tone-spreading leads to contours for HLHL sequences:

= [máyọ̀mǐ râwě]

- Downstep has been reported in several studies, as has downdrift (declination) across sequences of L tones.

Questions and Goals

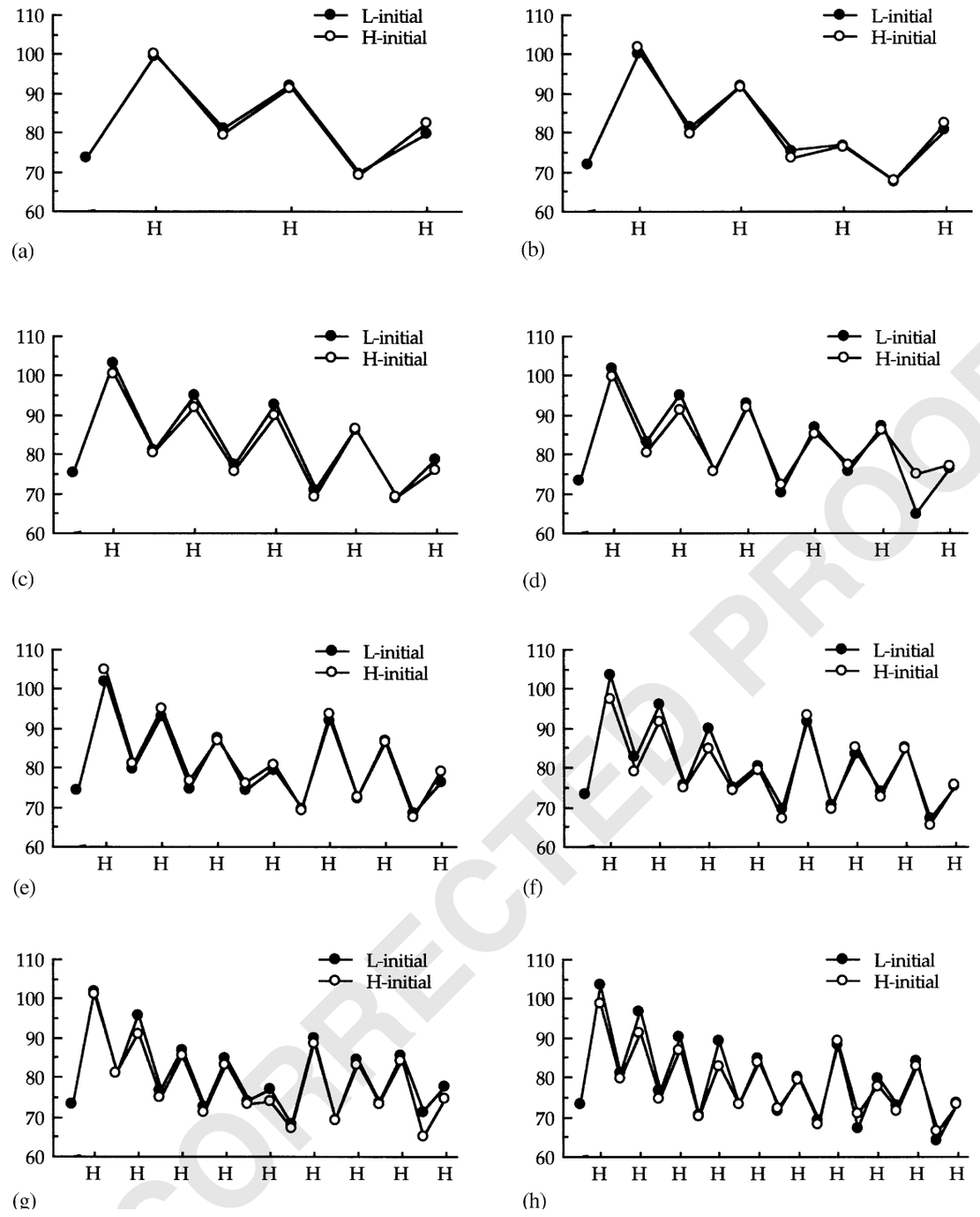
- Yoruba claimed to have automatic downstep: progressive lowering of H tones after L.
    - Is there evidence for *downstep*, as opposed to *declination* or *downdrift* of tone levels, which are not conditioned by tone sequence.
- How does downstep interact with H scaling. It has been claimed that H tones raise before L?
- How much "look-ahead" is there, setting the levels of initial H based on the number of down steps that will be encountered in the utterance.

Experiment 1

Materials: HL sequences of different lengths, beginning either with H or L

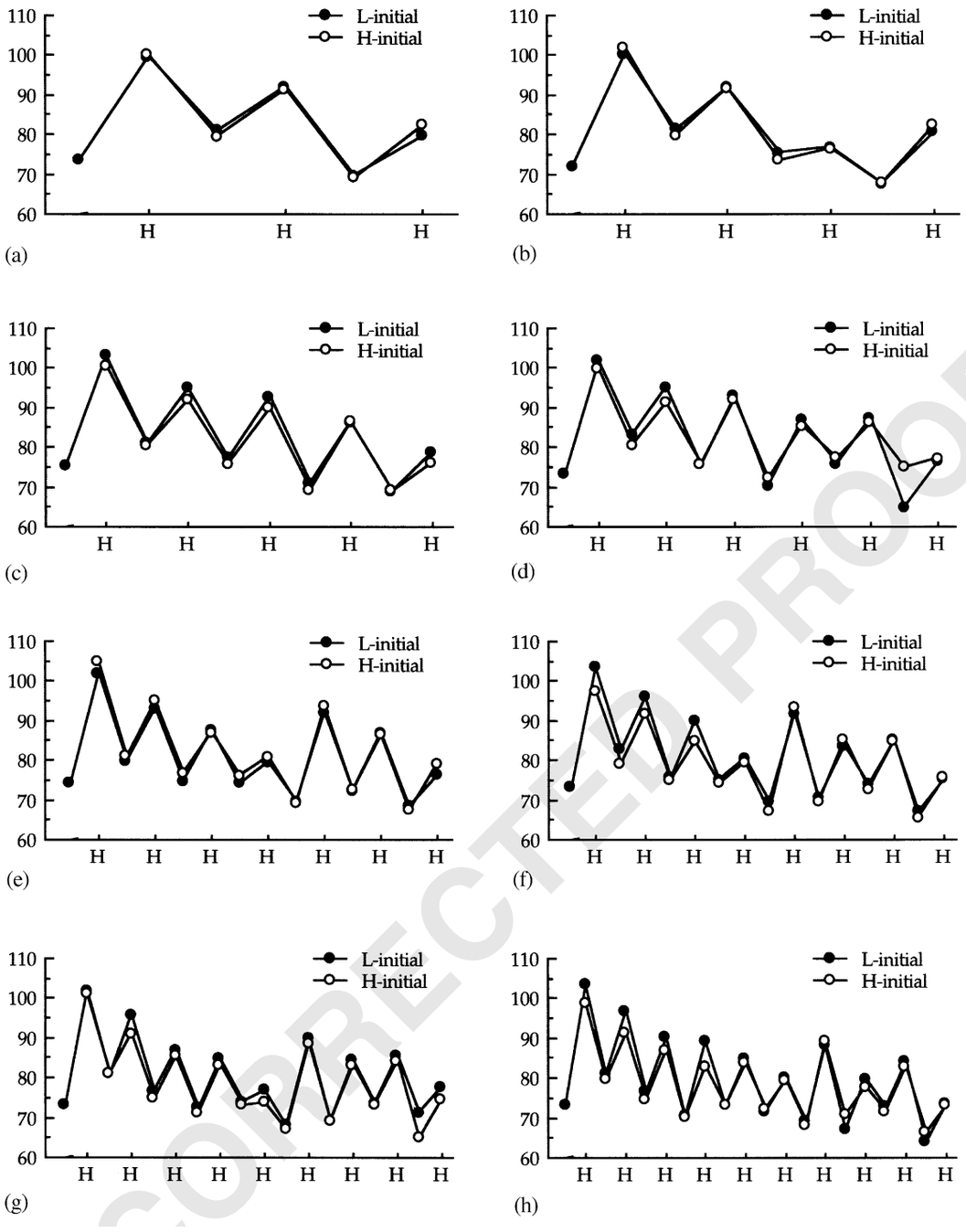
- Do H tone sequences show downstep effects? ✔
- Do L tone sequences show downstep effects?
  less clear. for some speakers—TJ in particular—in shorter sequences
- Does a sentence-initial L tone downstep a following H tone? ✘
- Are initial H tones scaled higher as the number of downsteps increases? ✘
- Does the size of the downstep interval decrease as the number of downsteps increases? ✘
- Do final H tones drop to lower values in sentences with more downsteps?
  small effect only for TJ
- Are later H tones reset to higher values in sentences with more downsteps? ✔
  main strategy used to economize pitch space by all subjects.

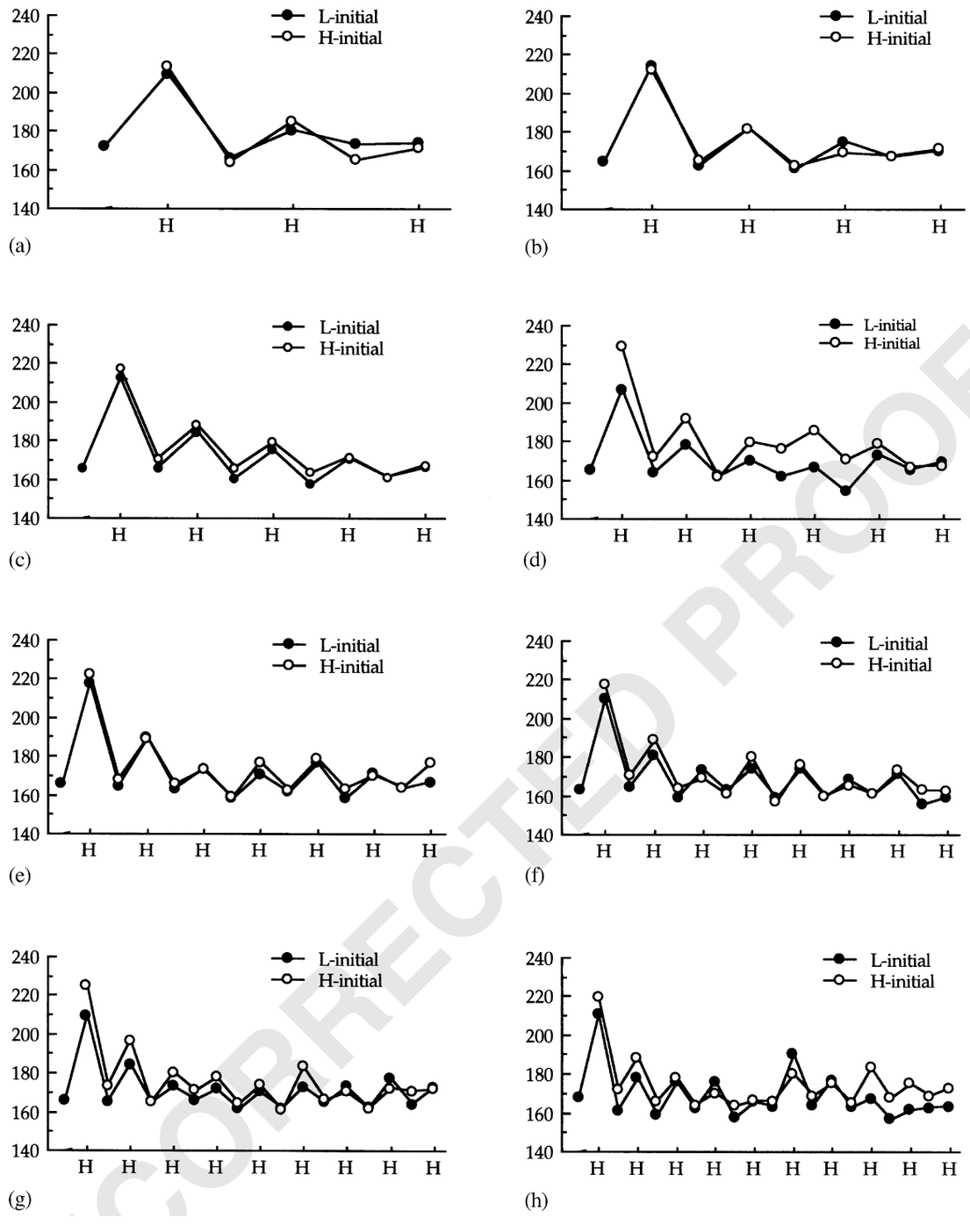
TJ



KG

FA





Experiment 2

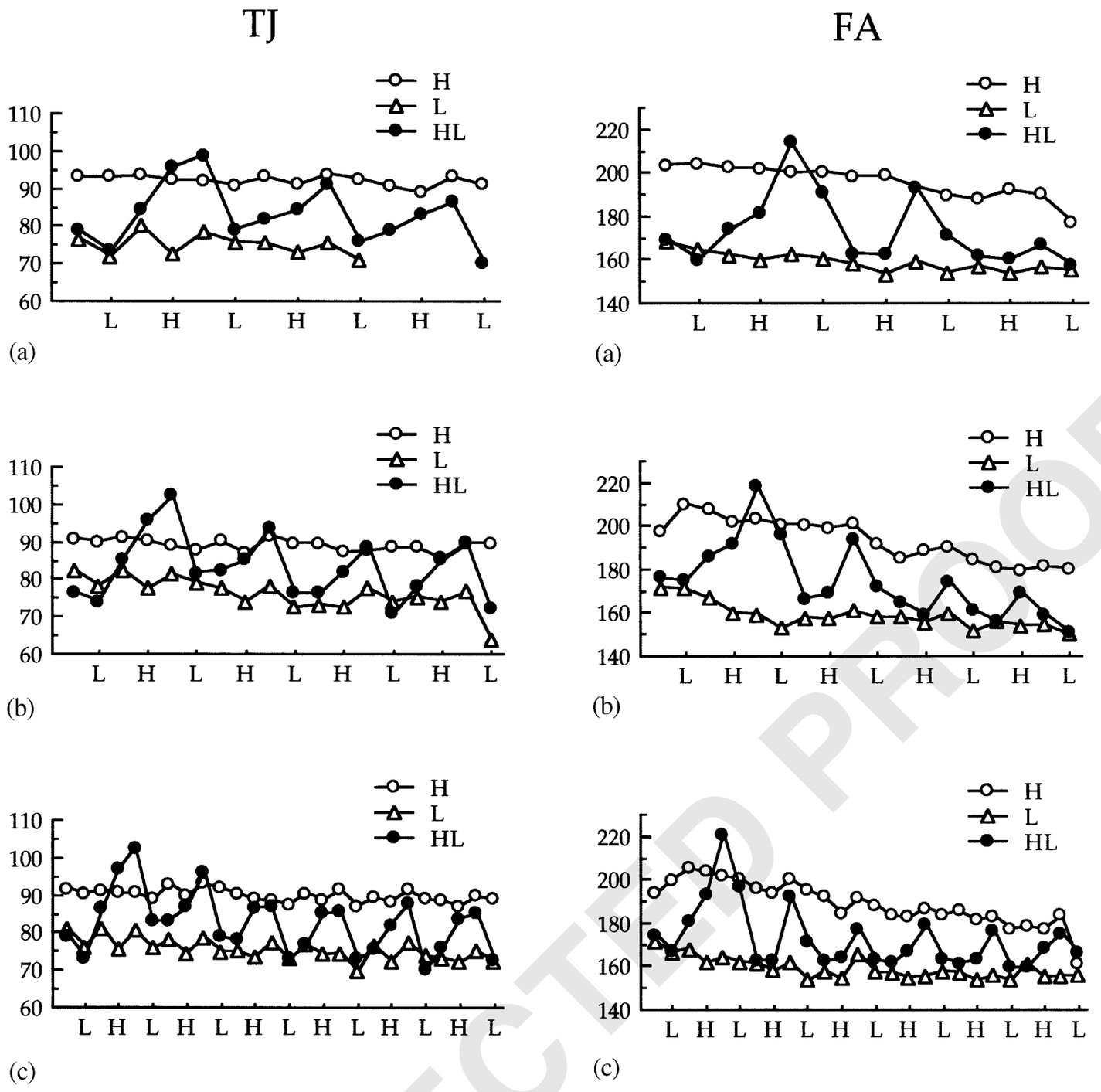
Materials:All-H, all-L sequences of different lengths

- Is declining ramp of H in expt 1 due to downstep or overall declination (downdrift) of H tones ?

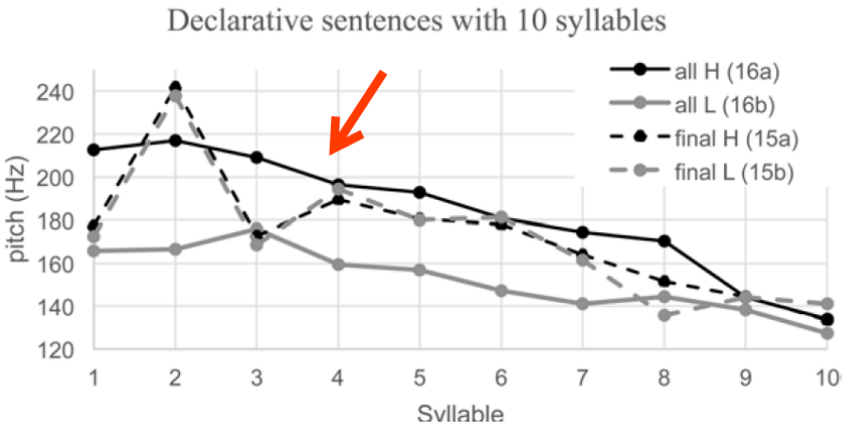
- *H shows much steeper decline in HL sequences.*

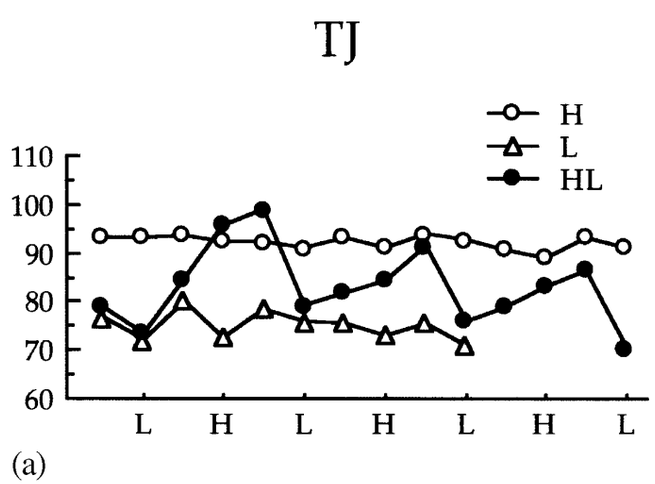
- *First H is much higher in HL sequences than all-H. Due to H-raising before L*

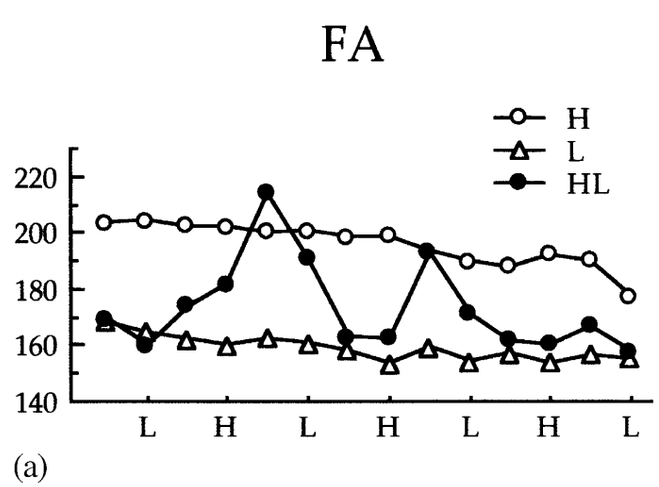
- *L shows similar decline to expt 1, so effects there are likely not due to downstep.*

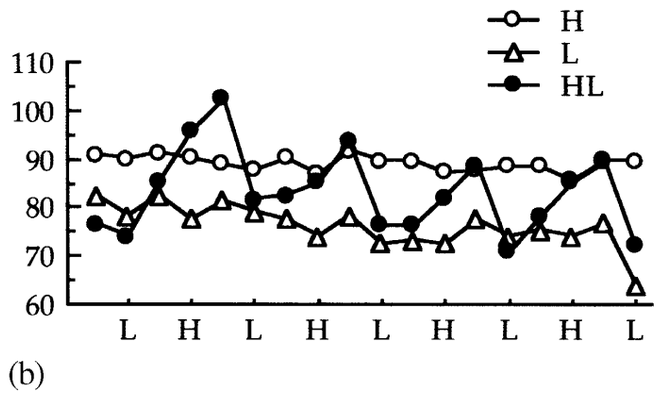


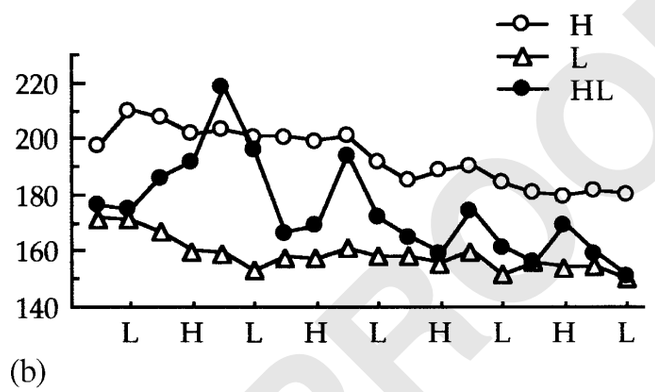
Pattern is different than Akan, particularly for FA, where the downtrend in H was pretty much the same in all-H and H-L

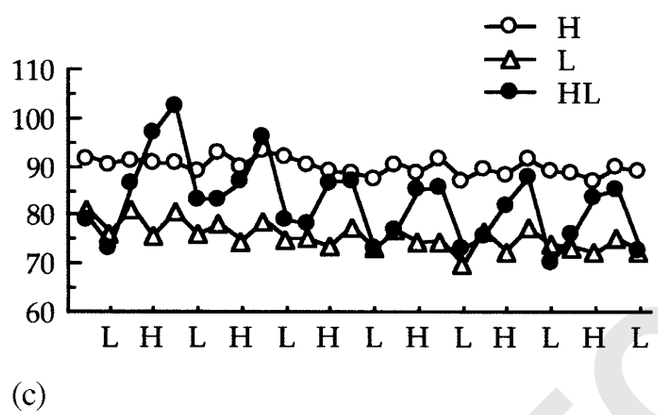


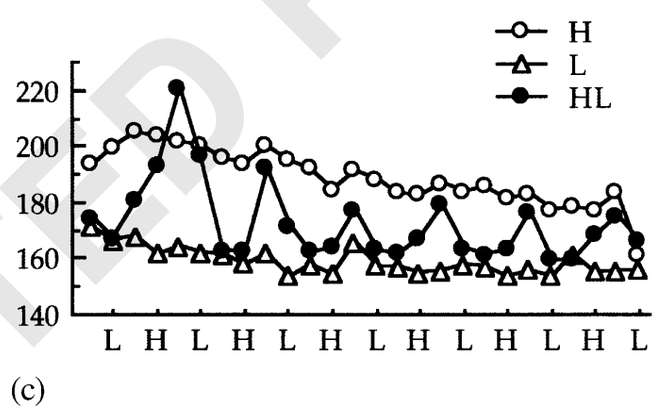








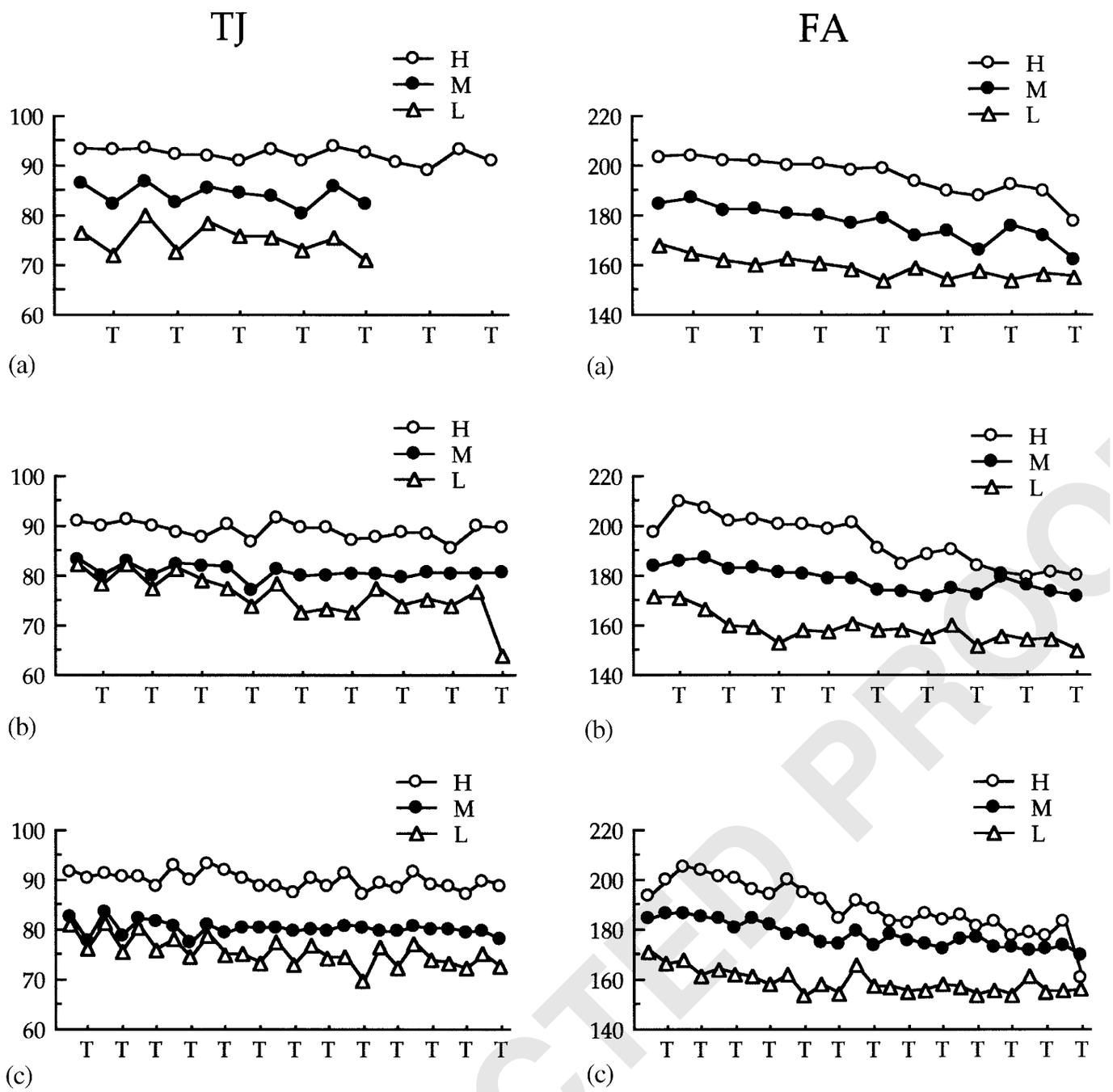




Experiment 3

Materials: all-M sequences, LM, MH, LMH seqs, of different lengths

- Patterns of declination differ across tones and across speakers. No regularity.
- FA shows substantial declination, greater for H tones
- TJ shows declination primarily for L tones,



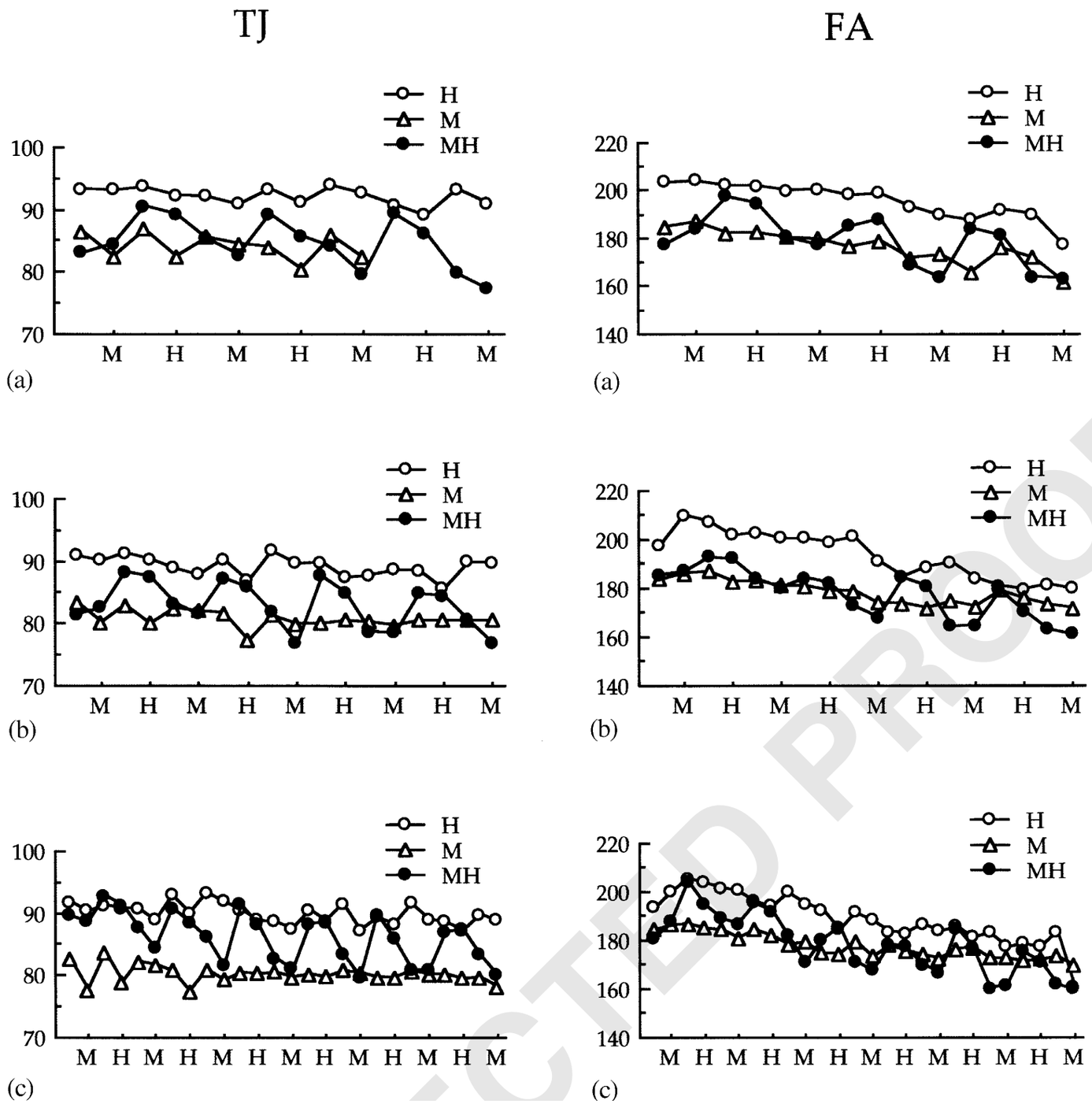
- Is apparent H-raising is expt 1 actually due to lowering of all-H?

- *No, all-H is higher than MH*

- Does M trigger down step of H?

- *No for TJ*

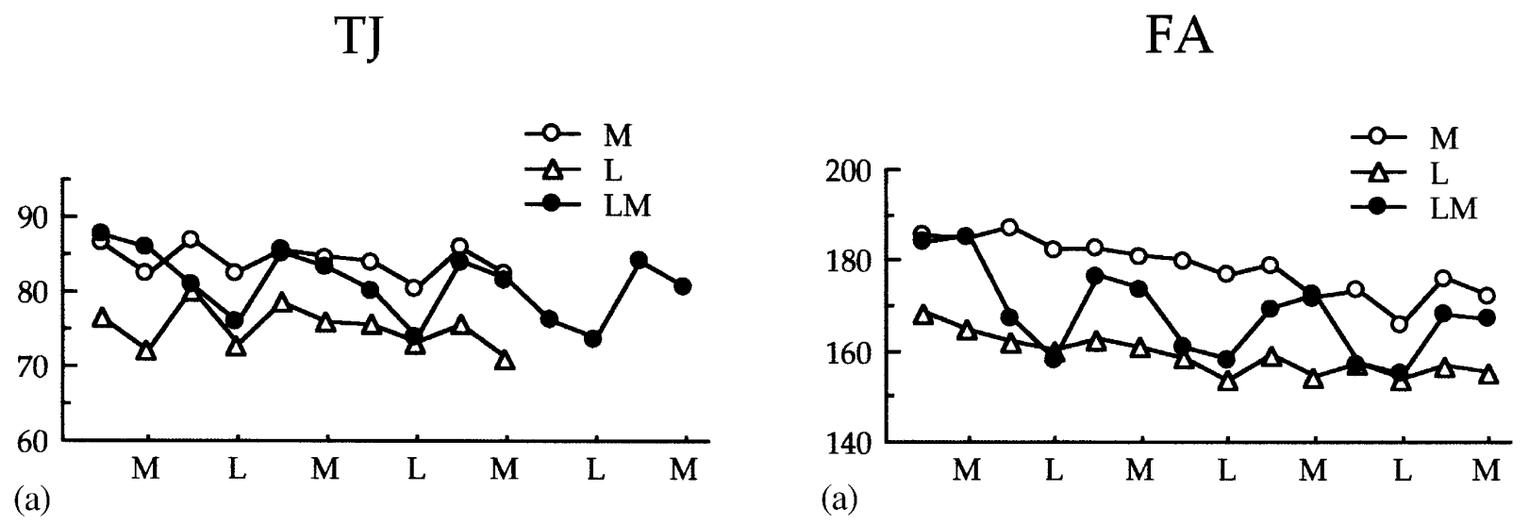
- *FA shows lowering in MH but not more than in all-H*



- Is M down stepped by L?

- *No, rate of decline of M in LM is comparable to decline of all-M.*

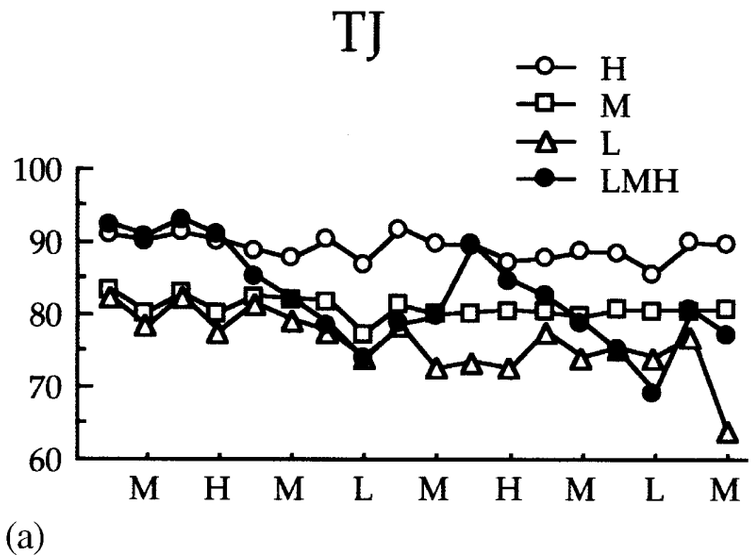
- *rate of decline of L in LM is comparable to decline of all-L.*

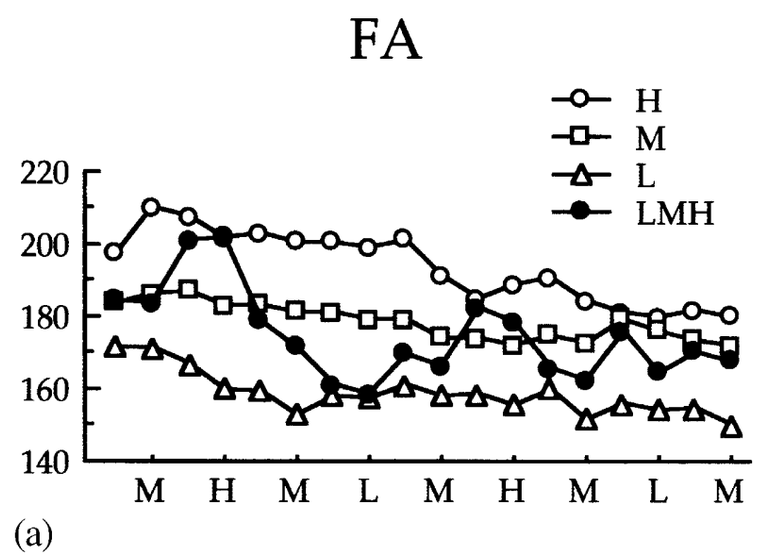


- Is H down stepped by L when a M intervenes (LMH)?

- *No. Values of all tones in LMH sequences are comparable to their values in all-H, all-M, all-L sequences*

- *Some possible effects for FA. H and M lower than the all-H and all-M sequences.*





Summary Expts 1-3

- Downstep applies to H tones, but not to L tones, in mixed-HL sentences.
- H raising interacts with downstep to raise the values of all H tones preceding L tones.
- L tones do not downstep M tones, nor do M tones downstep H tones.
- L tones do not appear to downstep H tones at a distance, but only when adjacent to them.
- No evidence for global lowering (“total downstep”) of all-H sentences.

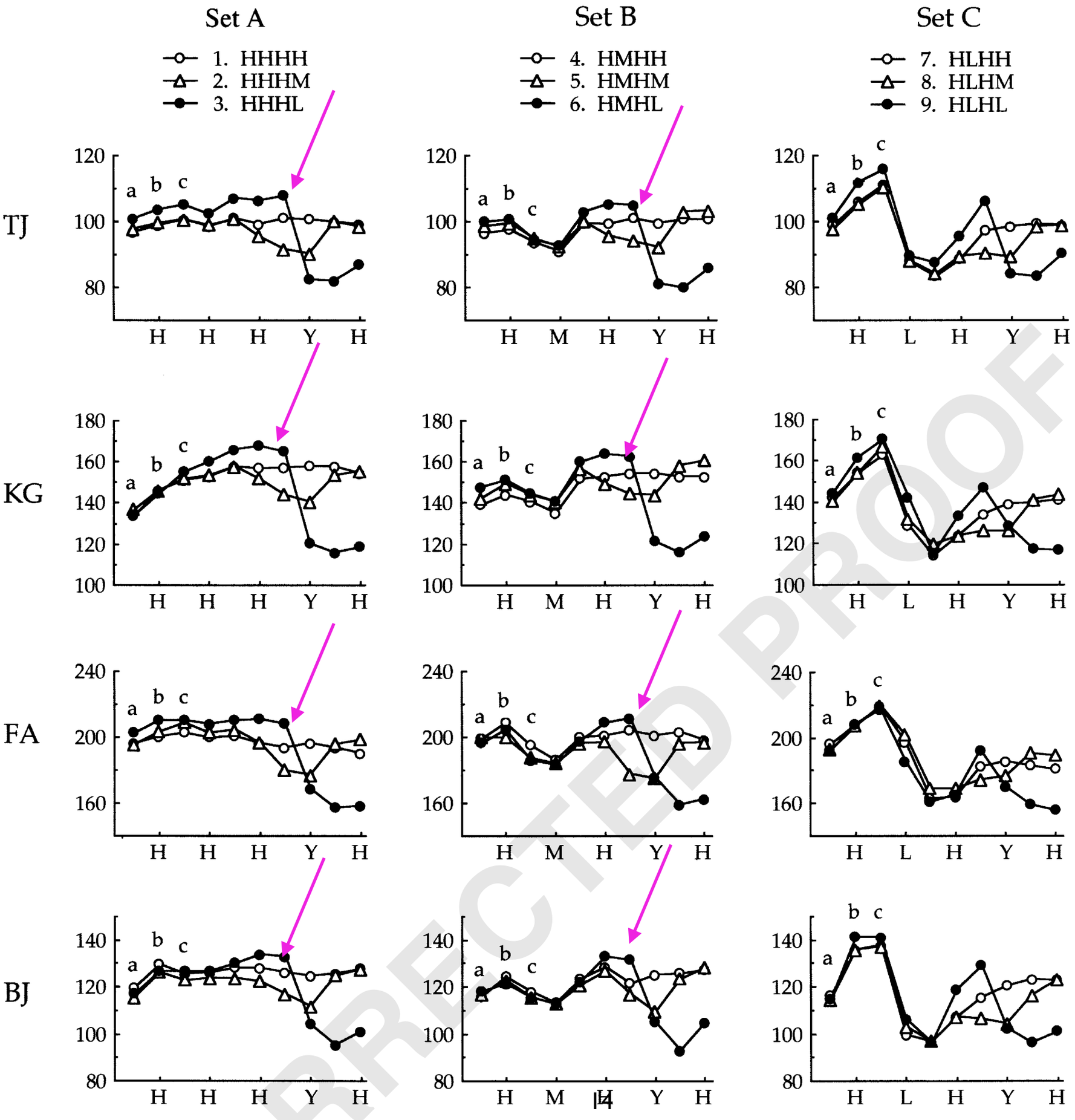
Experiment 4

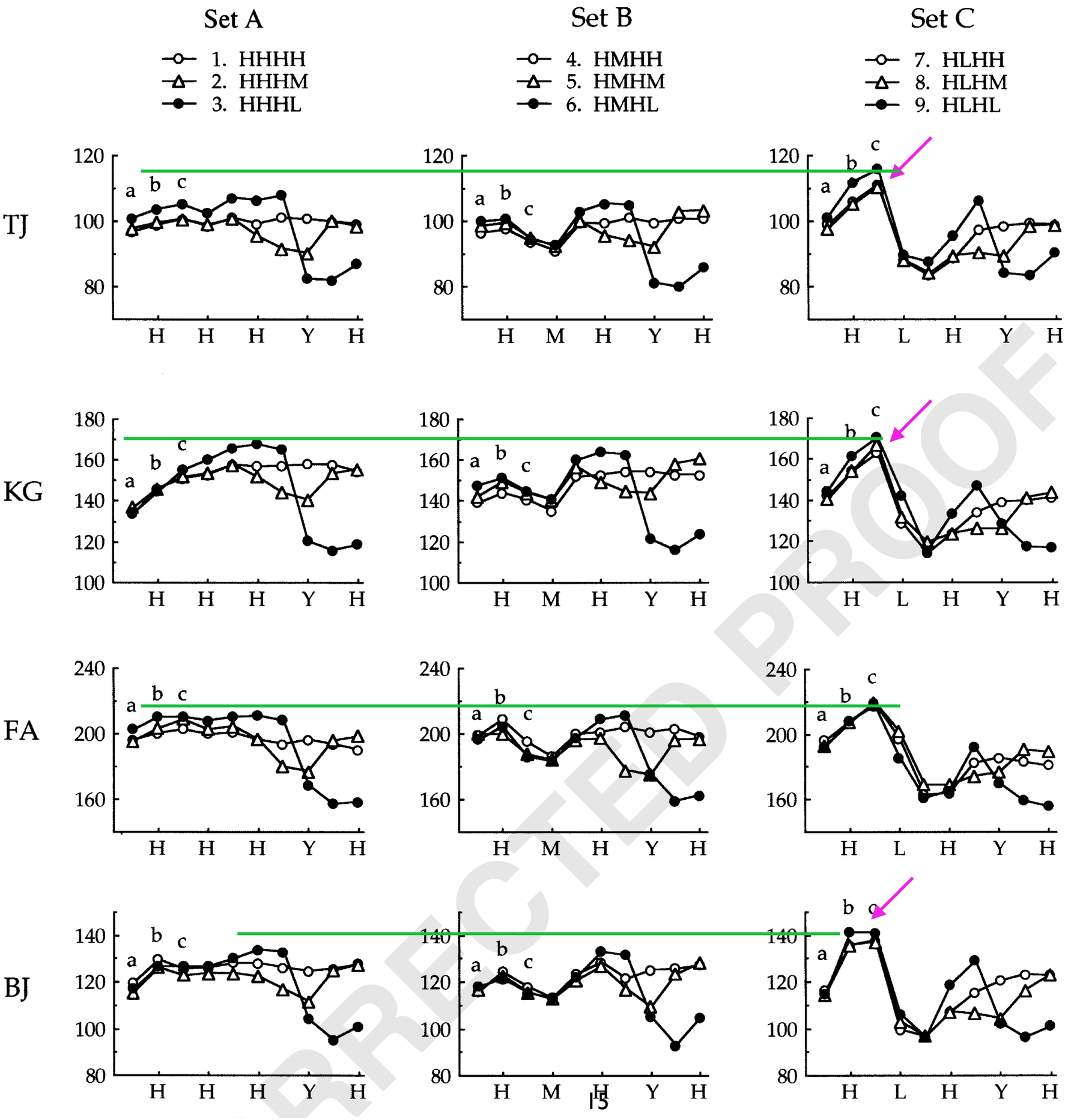
- Materials

Set A (HHH *Y* …)	Set B (HMH *Y* …)	Set C (HLH *Y* …)
1. HHHH…	4. HMHH…	7. HLHH…
2. HHHM…	5. HMHM…	8. HLHM…
3. HHHL…	6. HMHL…	9. HLHL…

- Test:
  - Preplanning: compare first H in 7-8 to that in 9.
  - Does H-raising operate independently of downstep: H raising in 3 and 6?

Evidence for independence of H raising





Evidence for pre-planning;
Initial H in 7-8 vs 9

Evidence for pre-planning;
Initial H in 9 vs Hs in 3 or 6

Effect is small, but significant for TJ and KG

Modeling Downstep: "soft-landing" model

$$H_n = d^{n-1}(H_1 - r) + r.$$

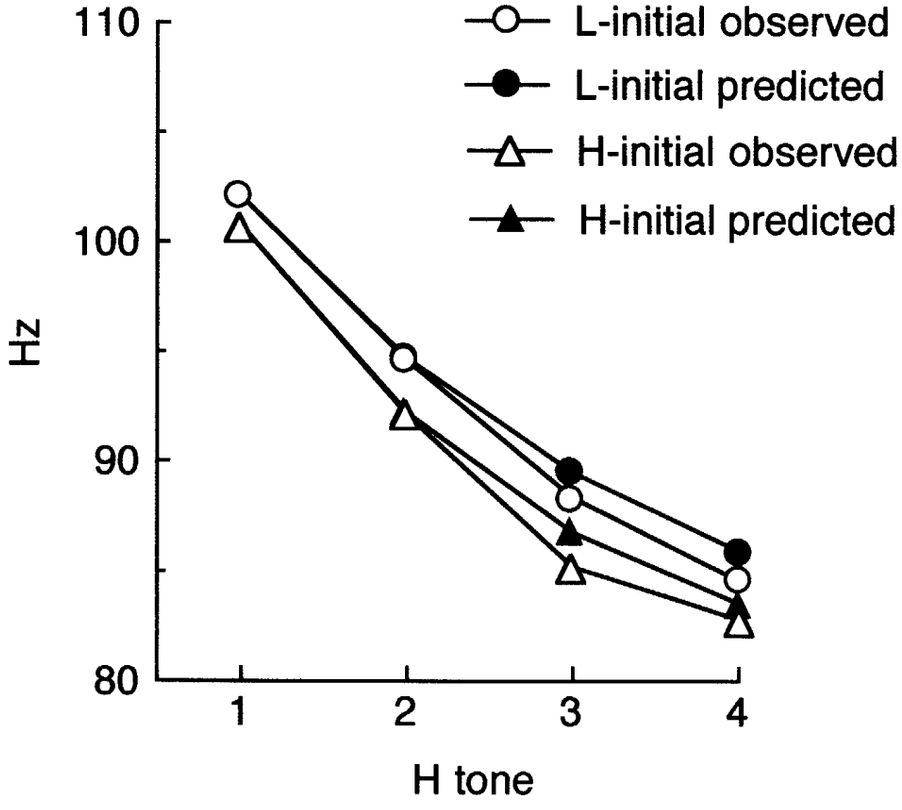
d is downstep factor

r is reference level (lowest final H)

$$H_n = d(H_{n-1} - r) + r$$

Equivalent to iterating this DS

- Authors' problem with this model
  - Only fits TJ
  - FA data appear consistent but not after removing effect of downdrift
  - Later spans doesn't fit
- My problems
  - Why is it necessary to remove the effect of downdraft? Downdrift could be like an articulator that contributes to the task of downstep.
  - Model is not implemented formally/ dynamically. Process of determining where the downsteps occur is not part of system.



High-raising

- Modeled as an upstep

$$H^+ = u(H_\mathrm{b} - r) + r,$$

Hb is nominal target of H without downstep or -H-taising

- And can be combined with downstep, as they both apply to some tones, for example in HL<u>H</u>L

$$H_n = \langle u \rangle d_{n-1}(H_\mathrm{b} - r) + r.$$

Table 8
Predicted and observed values of the H tones in TJ's sentences 5, 8, and 9 (observed values are parenthesized)

Sentence 5 (HMHM)	H_1	99.5 (99.5)
	H_2	99.5 (100.1)
Sentence 8 (HLHM)	H_1	111.1 (110.6)
	H_2	94.1 (90.5)
Sentence 9 (HLHL)	H_1	111.1 (115.9)
	H_2	102.7 (106.5)

Reset patterns: F0 of successive resets

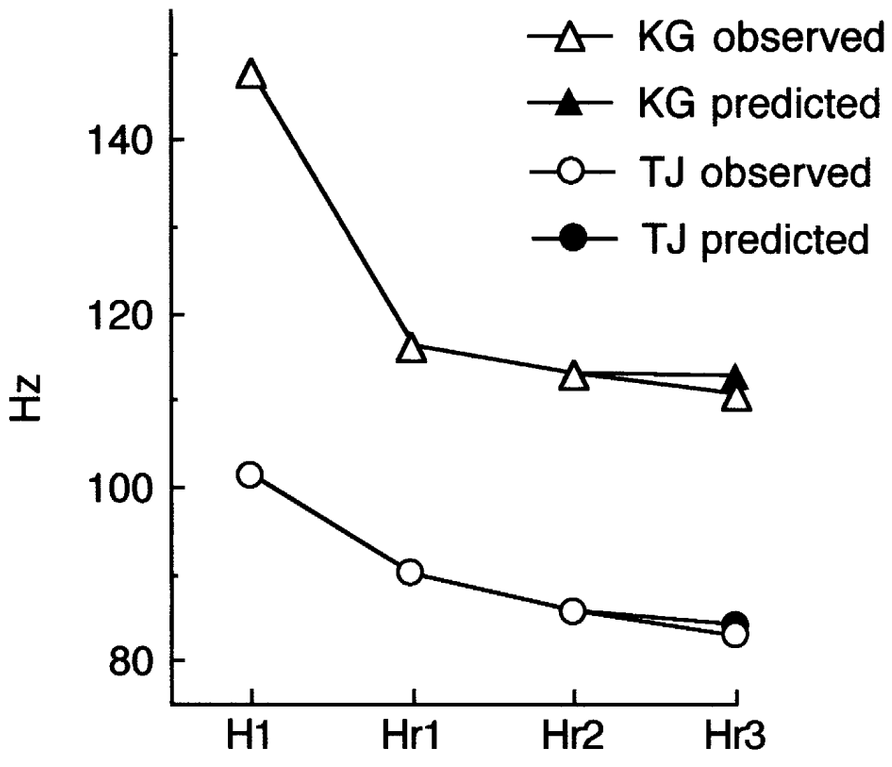
Table 9
Resetting patterns in the mixed-HL sentences of Experiment 1

	TJ			FA			KG		
	L-in	H-in	pooled	L-in	H-in	pooled	L-in	H-in	pooled
H_1	102.7	100.5	101.6	211.2	223.0	217.1	149.7	146.4	148.0
H_{r1}	90.0	90.4	90.2	175.7	181.9	178.8	117.2	115.5	116.4
H_{r2}	85.1	86.7	85.9	181.0	176.5	178.3	111.9	114.6	113.2
H_{r3}	—	83.1	83.1	—	—	—	110.1	111.4	110.8

Values are averages in Hz over pooled H- and L-initial sentences (d)–(h). H_1 = first H tone, H_{rn} = nth reset H tone. Only three values are given for FA, who normally reset only twice in our data.

$$H_r n = d'(H_{rn-1} - r) + r$$

$$d' = H_{r1} - r / H_{in} - r.$$



- Problems:
- Regularity of divergence
- Maybe one step down and then downdrift, particularly for FA
- Later spans doesn't fit
- Pragmatic and discourse level
- Variability

What kind of dynamical model would actually produce resets??

Why does a language have both downstep and H-raising

- Conspire to keep H out of M range, while still allowing the "terracing" that down step provides.
- My problems with this
- This conspiracy is not actually part of the models.
- This argument refers to <u>function</u>, but what is the function of downstep?